IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Dale M. Pitt	Attorney Docket No.	BOEI-1-1195
Serial No.:	10/653,013	Group Art Unit:	3644
Filing Date:	August 28, 2003	Examiner:	DINH, T.Q.

Title: APPARATUS FOR INCREASE OF AIRCRAFT LIFT AND MANEUVERABILITY

DECLARATION UNDER 37 C.F.R. § 1.131 AND REGARDING LONG-FELT NEED, AND UNEXPECTED RESULTS

DR. DALE M. PITT, as the inventor of the invention disclosed in the above-referenced patent application entitled APPARATUS FOR INCREASE OF AIRCRAFT LIFT AND MANEUVERABILITY, hereby declares as follows:

I have a Bachelor's of Science in Aeronautical Engineering from the University of Missouri - Rolla, 1972, and an M.S. in Aeronautical Engineering from the University of Missouri – Rolla, 1975. I attained my Doctor of Science Degree in Mechanical Engineering from Washington University of St. Louis, Missouri in 1980.

I am a Boeing Technical Fellow, and have worked in the field of Aeroelasticity and Unsteady Aerodynamics for over 30 years. Among my accomplishments include development of an unsteady aerodynamic model for helicopter rotors. I developed computational tools to evaluate the unsteady aerodynamic effects of flutter in aircraft wings. I have utilized Computational Fluid Dynamics and Linear Aerodynamics to predict flutter characteristics of fighter aircrafts such as the F-15 and F-18 for different aerodynamic flight conditions. I am an Associate Technical Fellow of the American Institute of Aeronautics and Astronautics. I also serve as Adjunct Professor of Mechanical and Aerospace engineering at Washington University in St. Louis. I have published over 40 technical papers in the field of aeronautics.

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I am the inventor of the invention described and claimed in U.S. patent application serial No. 10/653,013, entitled APPARATUS FOR INCREASE OF AIRCRAFT LIFT AND MANEUVERABILITY.

DECLARATION UNDER 37 C.F.R. § 1.131

Prior to April 7, 2003, I had conceived the X-wing system for morphing airfoils including the morphing airfoil system specifically described in Claim 1, the aircraft specifically described in Claim 33, and the morphing rotating airfoil system specifically described in Claim 55.

Also prior to April 7, 2003, I had conceived a variety of alternate aspects of the morphing airfoil system of Claim 1, including a hinge (Claim 2), a pivot (Claim 3), a drive mechanism (Claim 4), moving the airfoils perpendicular to the chords (Claim 5), the spans being substantially parallel in the first position (Claim 8), the spans being at an acute angle in the second position (Claim 9), and the two airfoils forming a single airfoil in the first position (Claim 10).

Prior to April 7, 2003, I had conceived a variety of alternate aspects of the aircraft of Claim 33, including a hinge (Claim 34), a pivot (Claim 35), a drive mechanism (Claim 36), moving the airfoils perpendicular to the chords (Claim 37), the spans being substantially parallel in the first position (Claim 40), the spans being at an acute angle in the second position (Claim 41), and including an unmanned air vehicle (Claim 42).

Prior to April 7, 2003, I had conceived a variety of alternate aspects of the morphing rotating airfoil system of Claim 55, including a hinge (Claim 56), a pivot (Claim 57), a drive mechanism (Claim 58), moving the airfoils perpendicular to the chords (Claim 59), the spans being substantially parallel in the first position (Claim 62), the spans being at an acute angle in the second position (Claim 63), the two airfoils forming a single airfoil in the first position (Claim 64), the hub being attached to an aircraft fuselage (Claim 65), and including an unmanned air vehicle (Claim 66).

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Attached as Exhibit A to this declaration is a true and correct redacted copy of my own handwritten invention notes created near the date of the conception of the invention, prior to April 7, 2003 (the date of the notes is redacted), describing increasing lift morphing an airfoil by separating of a combined airfoil into two airfoils towards their tips.

LONG-FELT NEED AND UNEXPECTED RESULTS

There has been a long-time existing need for increased ranges of combined low speed and high speed performance in aircraft, as well as for higher stall angles. Swing-wing technologies, such as used on the F-111 provide increased ranges of high speed and low speed performance. Short take-off and landing (STOL) aircraft utilize flap and slat mechanisms for increasing stall angle and lift at slow speeds. Military applications have continuously called for long-range/long duration cruise or linger capabilities, combined with high speed dash capabilities in aircraft. This need for increased ranges of high speed and low speed capabilities, and increased stall angles in for aircraft has been persistent, and has been a target of research throughout the aviation era. This need has been long recognized in the art and attacked through many different methodologies, such as those mentioned.

The need for high speed/low speed characteristics and high stall angles has not been solved. Approaches to date involving variable wing configurations have derived lift increases in the range of 30% to 50% and increases in stall angle in the range of 25%. There remains a further need for variable lift airfoils, including variable lift characteristics approaching 100% and stall angle increases approaching 50%.

I have been part of an effort at Boeing since 1998 to design and construct aircraft with disparate high speed/low speed capabilities, and increased stall angles, especially in applications relating to unmanned aircraft. Boeing has devoted over $2,000,000.00 of research time and analysis, including 120 worker-months of effort, to examine methods for increasing high speed/low speed capabilities for manned and unmanned aircraft.

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I conceived and sketched the idea of the split wing or X-wing prior to April 7, 2003. I performed a preliminary aerodynamic analysis of the X-wing in prior to April 7, 2003. Under my direction, Boeing prepared drawings of a wind tunnel test model, and that model was constructed prior to April 7, 2003. Prior to April 7, 2003, testing of the X-wing wind tunnel model indicated that lift in an X-wing configuration can be increased by nearly a 100%, and the stall angle of aircraft may be increased by up to 50% as compared to the combined airfoil when the airfoils are in a deployed/extended or X-configuration.

This percentage increase in lift is greater than I was expecting given the proximity of the wings near the roots and other factors. The derivation and results of the X-wing configuration are not obvious. The aerodynamic analysis of this configuration took considerable time. Development of the wind tunnel model and the testing took several months. The results, as noted were beyond the range I expected.

Despite the presentation of an "x-wing" vertical take-off space vehicle in the Star Wars movie series commencing in the 1970s, I have never seen any discussion of, testing of, or analysis of, X-wing configurations for aircraft operating in an atmosphere. Given the vertical take-off and space travel characteristics of the X-wing spacecraft in Star Wars, it is not suggested that the so-called "X-wing" is a lifting airfoil, nor do the movies suggest combination of the X-wing with a lifting airfoil.

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I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

March 16, 2005
Date

Dale M Pitt
Dr. Dale M. Pitt

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CUSTOMER NUMBER

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